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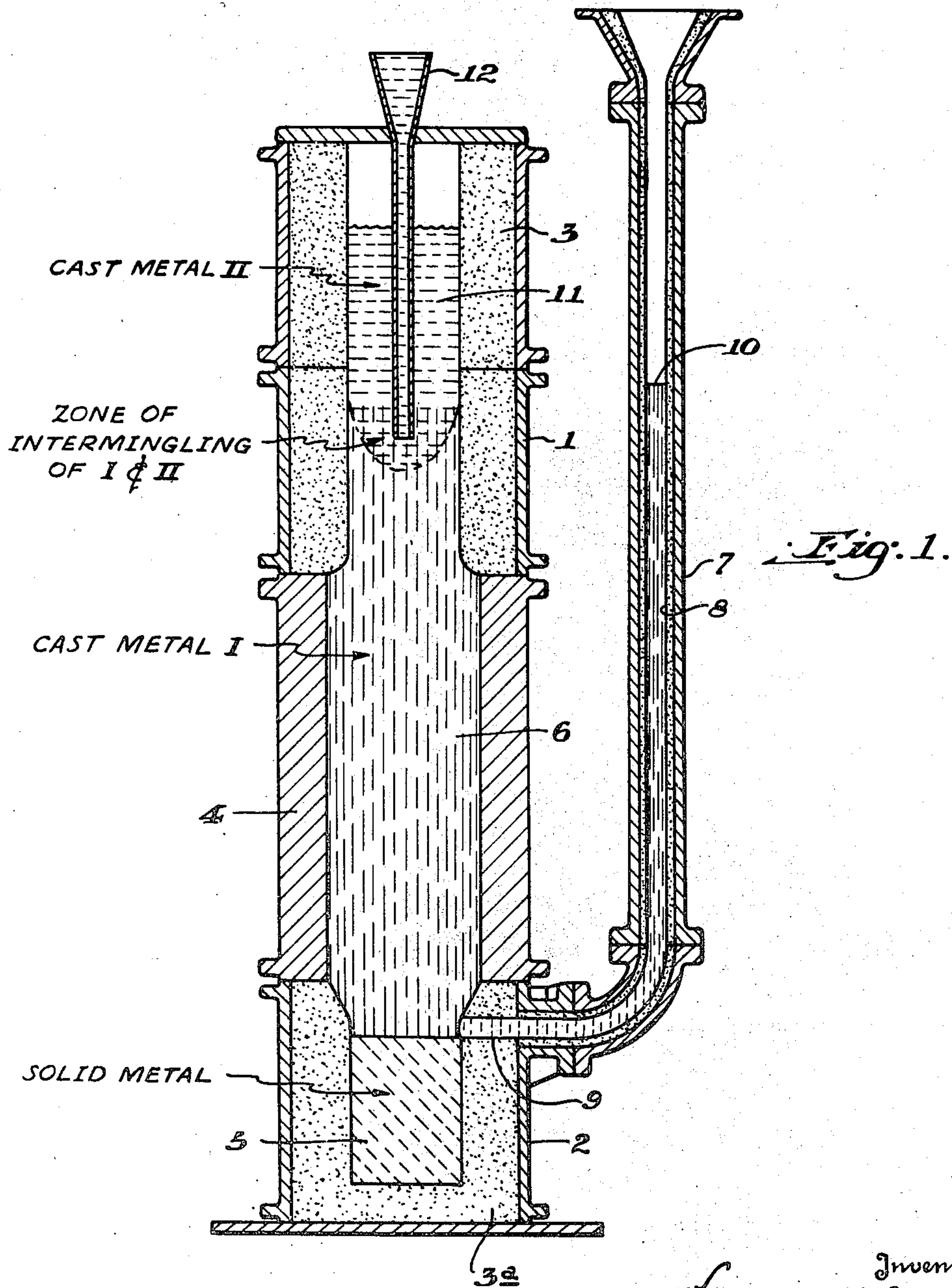
W. H. SEAMAN

2,483,849

METHOD OF MAKING COMPOSITE CASTINGS

Filed May 2, 1947

2 Sheets-Sheet 1



Inventor  
WILLIAM H. SEAMAN.

By *Ernest C. Cichlow, Elmer S. Seaman.*  
Attorneys.

**Oct. 4, 1949.**

**W. H. SEAMAN**

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## METHOD OF MAKING COMPOSITE CASTINGS

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2 Sheets-Sheet 2

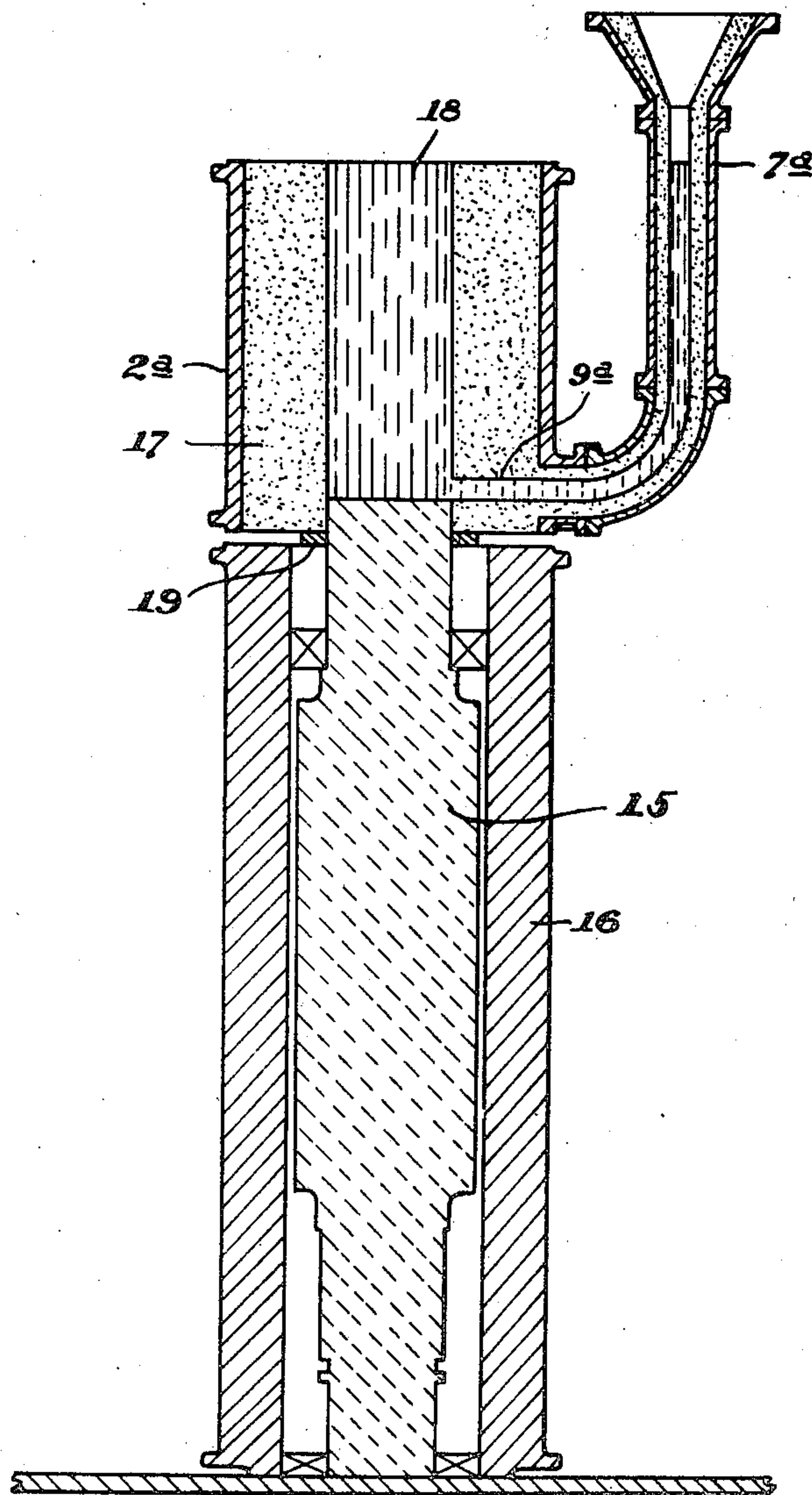


Fig: 2.

Inventor  
WILLIAM H. SEAMAN.

EX D  
C. T. Fern, Critchlow, Thier & Beckham  
his Attorneys.



## UNITED STATES PATENT OFFICE

2,483,849

## METHOD OF MAKING COMPOSITE CASTINGS

William H. Seaman, Salina, Pa.

Application May 2, 1947, Serial No. 745,611

8 Claims. (Cl. 22—206)

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This invention relates to the making of composite metal castings, and more particularly to composite metal rolls.

It is among the objects of the invention to provide a method of making castings from two or more metals of dissimilar characteristics, which is simple, economical, and easily practiced, which does not involve any complicating changes in existing casting practices, and which results in sound castings in which the dissimilar metal portions are thoroughly and soundly united.

A further object is to provide a method in accordance with the foregoing object that is particularly adapted to the making of rolls for rolling mills, especially rolls having a body portion that is harder than the neck portions.

Other objects will appear from the following specification.

The invention will be described with reference to the accompanying drawing which Figs. 1 and 2 are vertical sectional views through molds illustrating the application of the invention, respectively, to the making of a composite roll; and to roll repair.

I have discovered, and it is upon this that my invention is in large part predicated that composite castings of metals of dissimilar characteristics can be made readily and easily by providing a mold adapted to form the desired casting, disposing in one portion of the mold a solid block of metal possessing desired characteristics, and then introducing a molten metal of different desired characteristics into the mold tangentially of the mold and at or closely adjacent to the exposed surface of the said solid block. Molten metal is thus cast in an amount to fill the mold to the desired extent. I find that in this manner there is obtained a sound union between the cast molten metal and the initially solid metal block, with production of a composite casting of metals of different characteristics.

For some purposes it is desired to have castings comprising, for example, a body portion of metal of one characteristic and end portions of metal of different characteristics, as in the case of rolls for rolling metal. In accordance with the present invention such castings are produced by proceeding as just described, i. e., by disposing a solid block of metal of one characteristic in one end of the mold and then casting metal of a different

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characteristic tangentially of the mold at the upper surface of the solid body to form the main body of the casting, and then, in accordance with a further feature of the invention, while that cast metal is still molten introducing close to but below its upper surface molten metal having characteristics dissimilar from those of the body, e. g., those of the said solid block. An important feature of this latter aspect of the invention is that as the molten metal forming the body of the casting rises within the mold non-metallic impurities and the like rise to its surface, and by introducing the last metal cast below the surface of the first metal cast such impurities continue to be floated to the upper surface of the finished casting, thus avoiding the entrainment into the metal that would result if the last cast metal impinged on the surface of that cast first. In this way imperfections in the casting and weaknesses due to included impurities are avoided. Also, such introduction of the metal last cast below but close to the surface of the metal first cast insures a thorough and sound mechanical union between these two metals of different characteristics.

The invention may be described further with reference to Fig. 1, which illustrates the application of the method to the making of a roll having neck portions of metal of one characteristic and a body portion of metal of a different character. To this end there is provided a mold comprising a cope member 1 and a drag member 2 provided, as customary, with baked core sand portions 3 and 3a for forming the roll necks. The mold includes also an intermediate sleeve member 4 which in the embodiment shown consists of a metallic chill for forming the body of the roll.

In the making of, for example, a roll having a body portion of very high hardness and neck portions of lower hardness, there is placed, in accordance with the invention, in the cavity in the drag 2 a solid block 5 of machinable cast iron that possesses other characteristics desired in the roll neck. Molten cast iron 6 is now introduced into the mold through a sprue 7, having a baked core sand lining 8, and a gate 9 that enters the drag 2 at the level of the upper surface of block 5 and is positioned so that the cast metal enters the mold tangentially. Metal 6 is a cast iron that chills to provide the roll body with desired



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high hardness coupled with the necessary strength and other mechanical properties, and which in the case of cast irons will be harder and less machinable than neck portion 5. The body metal 6 is introduced into the mold to an appropriate level such as indicated by the metal level 10 in sprue 7, and before it has solidified the other neck is formed from molten cast iron of the same composition as body 5. This is introduced through a pouring funnel 12 the spout of which extends, as shown, to a short distance below the upper surface of cast body metal 6, whereby turbulence and agitation are avoided so that impurities floating on the surface of body metal 6 continue to rise at the surface of the neck metal 11. Similarly, neck metal 11 intermingles with body metal 6 in a cone-like zone, as indicated in the drawing, so that upon solidification the two portions are soundly united. When the upper neck portion has been filled to the desired extent the pouring funnel 12 is removed and the casting is allowed to solidify. Due to the wash of the metal introduced tangentially through gate 9 and to the heat of the cast body metal 6, the body 6 and the lower neck member 5 are likewise thoroughly and soundly united.

Although the invention has been described in particular detail with reference to the making of a composite metal roll, it will be understood from what has been said that various modifications are possible. Thus, the body 6 of the roll might be formed from steel of given characteristics, and the neck portions from cast iron or from steel of different characteristics. Likewise, the invention is not restricted to the making of rolls comprising a body portion of one character and end portions of metal of different characteristics, but is applicable equally to the production of other types of castings comprising one portion of given characteristics and another portion of dissimilar characteristics. It is equally applicable to the making of castings having an end portion providing one set of characteristics, a body portion of different characteristics, and another end portion the characteristics of which are different from those of the other two. Also, among other possible variations that will occur to those familiar with casting, it is not necessary for all purposes that one portion be formed against a chill.

As further exemplifying the applicability of the invention, it may be used for repairing castings, for instance rolls, in the manner shown in Fig. 2. A roll 15 from which one neck has been broken is placed vertically in a form 16 with the upper end of the broken neck extending into a drag 2a provided with a baked core sand lining 17 so that it acts as the solid metal insert 5 of Fig. 1. Metal, e. g. cast iron, of desired properties is then introduced through a sprue 7a and gate 9a tangentially of the mold at the upper level of the broken neck, as seen in Fig. 2. In this way a new neck 18 is formed that is soundly united to the roll 15. The roll may be held in position by a collar 19 that supports it against lateral movement.

According to the provisions of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

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I claim:

1. That method of providing a metal casting composed of one portion of metal of one characteristic and at least one other portion of ferrous metal of a different characteristic which comprises supplying a mold adapted to form said casting, disposing in one end of said mold a solid block of ferrous metal of one characteristic, and introducing molten ferrous metal of another characteristic into said mold tangentially thereof and in the plane of the exposed surface of said solid block to fill the mold to the desired extent.

2. A method according to claim 1, said ferrous metals being cast irons.

3. That method of making a casting which comprises providing a mold adapted to form said casting, disposing in one end of said mold a solid block of ferrous metal of one characteristic, introducing molten ferrous metal of another characteristic into said mold tangentially thereof and in the plane of the exposed surface of said solid block to fill the mold to the desired extent, and before said molten metal has solidified introducing below but close to its upper surface molten ferrous metal of different characteristic to form a further portion of the casting.

4. That method of making a casting which comprises providing a mold adapted to form said casting, disposing in one end of said mold a solid block of ferrous metal of one characteristic, introducing molten ferrous metal of another characteristic into said mold tangentially thereof and in the plane of the exposed surface of said solid block to fill the mold to the desired extent, and before said molten metal has solidified introducing below but close to its upper surface molten ferrous metal of substantially the same composition and properties as said solid block.

5. That method of making a ferrous metal roll composed of a body portion of metal of one characteristic and at least one neck portion of metal of a different characteristic which comprises providing a mold adapted to form said casting, disposing in the lower end of said mold a solid block of ferrous metal of one characteristic, introducing molten ferrous metal of another characteristic into said mold tangentially thereof and in the plane of the upper exposed surface of said solid block to fill the mold to the desired extent, and before said molten metal has solidified introducing below but close to its upper surface molten ferrous metal of different characteristic to form the other neck of the roll.

6. That method of making a ferrous metal roll composed of a body portion of metal of one characteristic and neck portions of metal of a different characteristic which comprises providing a mold adapted to form said casting, disposing in the lower end of said mold a neck-forming solid block of ferrous metal of one characteristic, introducing molten ferrous metal of another characteristic into said mold tangentially thereof and in the plane of the upper exposed surface of said solid block to fill the mold to the desired extent to form the body of the roll, and before said molten metal has solidified introducing below but close to its upper surface molten ferrous metal of substantially the same composition and properties as said solid block to form a neck of the roll.

7. A method according to claim 6, said neck portions and body portion being respectively cast irons of different characteristics.



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8. A method according to claim 7, the body portion cast iron being productive of a body of high hardness and low machinability, and the neck portions cast iron being softer and more machinable.

WILLIAM H. SEAMAN.

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